4. In all cases of chronic diarrhœa and in cases of general glandular involvement, the feces should be examined for tubercle bacilli.
5. Finding tubercle bacilli in the feces does not mean intestinal ulceration in all cases.
6. In arrested or healed pulmonary tuberculosis no tubercle bacilli are found in the sputum or the feces.
7. The feces should be studied for tubercle bacilli as a part of the routine examination, especially in suggestive cases and when no expectoration can be obtained.

I wish to extend my thanks to the various resident pathologists at the Philadelphia General Hospital for their valuable coöperation.

ACUTE INTUSSUSCEPTION IN THE ADULT.

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Intussusception, although far more common in children, occurs with sufficient frequency in the adult to warrant a careful study of the causes, pathology, and results. One-third of all cases of intestinal obstruction are due to intussusception. In 1000 cases of acute intestinal obstruction reported by C. L. Gibson,[1] 187 were due to intussusception, 121 to volvulus, 354 to hernia, 42 to Meckel's diverticulum, 40 to gallstones, 34 to openings, 16 to foreign bodies, 20 to miscellaneous causes. Leichtenstern[2] found 442 cases of intussusception in a collection of 1152 of intestinal obstruction, excluding congenital obstructions, stenosis of the rectum, and the various forms of hernia. The exact proportion of cases in children and adults is about 65 to 35. It is the most common cause of intestinal obstruction in children, and one of the most uncommon in adults. Treves gives the following table of frequency by age for acute intussusception: Before the age of eleven years, 53 per cent.; between eleven and twenty years, 12 per cent.; between twenty-one and forty years, 20 per cent.; between forty-one and sixty years, 11 per cent.; beyond sixty years, 4 per cent. or less. Sixty-five per cent. of all cases occur before the age of twenty, and 53 per cent. before eleven years. Twenty-five per cent. occur during the first year of life. In chronic intussusception the percentage differs: 50 per cent. of this class of cases occurs between twenty-one and forty, and only 25 per cent. under eleven years.

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[1] Annals of Surgery, 1900, p. 487.

[2] Vierteljahreschrift f. d. prakt. Heilk., 1873–74.

There are three anatomical varieties of intussusception: enteric, colic, and ileocolic. Of those occurring in the region of the ileocecal valve there are three forms: ileocecal, ileocolic, and a combination of these, called by Leichtenstern, iliaco-ileo-colica. The most common form of invagination is the ileocecal, the most uncommon being the ileocolic; the other varieties coming between these two in the order of enteric and colic.

Invaginations of the small bowel rarely occur in the upper portion of the intestinal tract, although a case is reported of the presence of duodenum in the invaginated portion of an ileocecal intussusception.[3] In one of our cases the invagination was of the jejunum, about three feet from the duodenal junction. Most enteric invaginations occur in the lower portion of the jejunum, next in frequency being the ileum, in about the proportion of 4 to 1.[4] In our first case the amount of gut invaginated was about three inches long, and this corresponds with the general experience of observers, that enteric invaginations usually involve relatively small portions of gut. The shortness of the invaginated portion does not interfere with the severity of the symptoms, or with a fatal termination if the condition be unrecognized and unrelieved.

Any portion of the large bowel may be involved in the colic variety of intussusception: the ascending into the transverse, the transverse into the descending, the descending into the sigmoid, or the sigmoid into the rectum. Colic intussusceptions are necessarily short, as the large bowel is fixed by its short mesentery.

Ileocecal intussusception is the commonest form. The ileocecal valve forms the apex of the invaginated portion of bowel. The ileum does not pass through the valve, but pushes the valve ahead of it. This form may attain great size. Cases are on record in which the valve traversed the entire length of the colon and presented itself at the anus, and even protruded through the sphincter. In the ileocolic variety the terminal portion of the ileum invaginates, passing through the ileocecal valve. The valve and cecum remain at their normal position and only later are carried into the colon. The third variety, iliaco-ileo-colica, is a combination of the ileocecal and the ileocolic, and is really an advanced stage of the ileocolic, in which the ileum is first protruded through the valve or down to it, and the cecum is then forced with the invaginated ileum into the colon.

The cause of all intussusception of the bowel is irregular muscular action, the muscles in the wall of bowel acting normally in one portion, while in an adjoining portion muscular action is abnormal, due to one of several causes. This abnormality may be a limited but severe muscular action, or a total muscular paralysis—spasmodic invagination and paralytic invagination. The experiments of Nothnagel have placed the pathology of intussusception on a fairly firm basis. He demonstrated the two forms, spasmodic and paralytic, in rabbits. In the spasmodic form the circular muscular fibers were made to contract, narrowing the lumen of the gut, while the adjacent bowel remained normal in size and activity. When he stimulated the bowel to the stomach side of the contracted portion, nothing happened. When, however, the bowel to the lower side was stimulated, the longitudinal fibers, by their contraction, caused the normal bowel to turn in on itself causing a progressive descending invagination, in which the contracted portion of bowel did not take place. The same thing occurred when the bowel was totally paralyzed by crushing. When an intussusception increases in length it does so at the expense of the sheath. The method of increase of the invaginated portion of the ileum in the ileocolic variety is different from the other varieties of intussusception; here the ileum protrudes through the ileocecal valve and meeting no resistance in the large cecum, grows by the protrusion of more and more ileum, and not at the expense of the sheath, the limit being reached by the length of the mesentery. Clinically, the spasmodic variety is the only one met with, and the vast majority are descending invaginations. Retrograde or ascending invaginations occur, but are of short duration and a very small portion of bowel is invaginated. As a rule, they reduce themselves and are, therefore, not often recognized although often suspected as the cause of transitory intestinal colic. Double and triple intussusception also occur but rarely. A recent reported case will be recited later.

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[3] Dr. Delipini, Path Soc. Trans.

[4] Treves, Int. Obstruction, p. 144.

Irregular muscular action of the intestinal muscularis is the requisite for intussusception. The causes which give rise to the irregular action are, ptomaïne poisoning, enteric fever, traumatism, growths of the bowel, benign and malignant. Ptomaïne poisoning, causing, as it does, violent action of the muscle of the bowel by the local irritation, and this action being irregularly distributed through the bowel, gives rise to the majority of cases of intussusception. The vast majority of cases of intussusception occur in children in the milk-feeding period. Impure milk is an extremely common cause of intestinal poisoning, hence we can reason from cause to effect. This frequency in children of intestinal colic due to infection, plus the increased mobility of the large bowel, is corroborative of this opinion. In the adult intussusception from ptomaïne poisoning is less common. The following case is in point:

G. M., agent, aged twenty-seven years, was referred to the German Hospital, August 3, 1905, by Dr. George Y. MacCracken. On August 1 he had eaten deviled crab and watermelon; he said the crab was bad. Several hours later he had a severe abdominal pain, colicky in character, and associated with vomiting. His abdomen was scaphoid, but there was no tenderness or rigidity. Morphine did not relieve the pain. Castor oil did not produce a stool. On the following day his abdomen was still scaphoid, with general tenderness, but no rigidity and no tumor could be made out; he was still vomiting and there was no bowel movement. He was admitted on August 3, with marked symptoms of intestinal obstruction. No tumor could be made out on account of the abdominal distention. Pulse 108; temperature normal. He had an anxious expression and his appearance was of one suffering from profound toxemia. Dr. MacCracken had diagnosticated ileocecal intussusception. His abdomen was rapidly opened and the diagnosis proved to be correct, except that it was an ileocolic invagination. It was impossible to reduce the invagination, which involved a large segment of the ileum, probably eighteen to twenty inches, and so an ileocolotomy with a Murphy's button was hastily performed. The man's condition forbade any further procedure. He lived but a few hours and died of shock and exhaustion.

We believe the exciting cause of this case was ptomaïne poisoning from decayed crab meat.

That intussusception occurs during the course of enteric fever is proved by the following recorded cases, which have come to notice since the practice of opening the abdomen for perforation or suspected perforation has come into vogue. Lieutenant-Colonel Jennings,[5] R. A. M. C., reports 2 cases occurring during enteric fever, giving rise to symptoms similar to perforation. The true condition was not discovered in either case until the necropsy was performed.

Ash[6] reports two cases, one in which six inches of ileum had slipped into the cecum. Operation six hours after the onset of symptoms. The patient, a soldier, aged twenty-five years, on the ninth day of a relapse was suddenly seized with acute abdominal pain which passed away only to return in an hour with vomiting and marked rigidity, but without distention. The pain was referred to the umbilicus and epigastric region. Under anesthesia a mass could be felt in the right iliac fossa which was dull to percussion. The patient was operated upon, the intussusception was reduced and the patient made an uninterrupted recovery. The second case reported by the same author, was discovered at postmortem; the third case was operated on by one of us (Ross), November 25, 1903, at the German Hospital.

Dr. J. C. Wilson speaks of invagination of the bowel occurring during the course of enteric fever, but relates no cases. This statement was probably founded on postmortem findings. Hart and Ashhurst[7] speak of having seen it occur during an attack of ambulatory typhoid. B. L. Bryant and J. S. Bragg[8] report a case, occurring in a man, aged twenty-three years. Ordinary course of typhoid fever. In fourth week sudden abdominal pain, localized in right iliac fossa, Pain intense, skin moist, small bowel movement. Temperature, 102°; pulse, 120; respiration, 24. Abdomen became very tender, most intense one inch above McBurney's point. One hour after attack, pulse 145, and weak. Abdomen not distended. Patient quiet. Diagnosis, perforation. Operation: three intussusceptions both ways: the first a short distance from ileocecal junction was eight inches long and easily reduced; the second, five inches long, a short distance from the first, was also easily reduced; and a third, three inches long, also in the ileum, was discovered. Patient died five hours after operation.

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[5] British Medical Journal, 1902, i, 1083.

[6] British Medical Journal, May 3, 1902.

[7] Annals of Surgery, January, 1904.

[8] Med. Record, November 18, 1905, p. 818.

Two cases have been operated on at the German Hospital. The first has been reported by one of us (Ross[9]), and the other was operated on by Dr. Deaver.

CASE I.—W. B., a male, aged seventeen years, in a severe attack of typhoid fever (with hemorrhages), was awakened on the twenty-sixth day with violent abdominal pain. He was thought to have perforation of the intestine, but operation disclosed an intussusception three inches from the junction of the duodenum and the jejunum. This was readily reduced, and although he had later hemorrhages, he made a good recovery. (Details of the case history may be found in the original report.)

I do not believe that there is a special pathological cause for intussusception under these circumstances, except it be the lack of muscular tone due to inflammatory infiltration of the bowel wall in localized areas, permitting a greater degree of distention in different portions of the bowel.

CASE II.—Miss J. S., aged nineteen years; single; a wireworker, was admitted February 27, 1906, on the nineteenth day of the disease, and was discharged on May 20, 1906. Diagnosis: enteric fever. Complications: hemorrhages, intussusception. Operation: reduction. Relapse: cholecystitis. Sequel: neuritis, with foot drop.

The family history is negative.

Previous History. The patient had measles, pertussis, varicella, and pneumonia (at six years). Menstruation established at fourteen years; regular but painful.

For several months she had felt indisposed and low-spirited. For two weeks before admission she had been confined to bed with high fever (according to her statement). Vomited once; had slight abdominal pain and some diarrhœa. No epistaxis; no cough, but considerable expectoration.

The physical examination was negative, except that the spleen was enlarged to percussion. No rose spots were found. On March 2, the Widal was negative, and on the 13th it was positive.

On the twenty-first day of the disease, three days after admission, and on the two subsequent days the patient had hemorrhages. There were eight bloody stools, amounting to 2040 c.c. The temperature dropped 8° F., from the evening of the twenty-first day to the morning of the twenty-third day of the disease. There was a rise again until the temperature reached 101.8° F. on the twenty-seventh day. Then followed a gradual decline until, on the evening of the thirty-fifth day, the record was 98.4° F. From this time there was another rise to 103.4° on the thirty-ninth day. On the fortieth day, at 2 A.M., the patient had some abdominal pain and vomited a yellow fluid with some mucus. At 11 A.M. she passed a small, liquid stool containing bloody mucus. At 2 P.M. the pain in the abdomen grew worse. At 5 P.M. another stool containing shreds of bloody mucus was passed. Later there were several more stools with streaks of blood and mucus. There was considerable tenesmus. During the day patient vomited six times. The vomitus changed from a yellow at 2 A.M. to light green at 5 A.M.; dark green at 11 P.M.; brown at 4.30 A.M. on the forty-first day; dark brown with fecal odor at 11.30 A.M. On the forty-first day, at 8 A.M., the abdominal pain became very severe, peristalsis was greatly increased. The leukocyte count was 11,000. A diagnosis of intussusception was made and the patient was transferred to the surgical department for operation.

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[9] Surgical Complications of Typhoid Fever. AMER. JOUR. MED. SCIENCES, 1905, cxxx, 115.

Operation. Dr. Deaver. Chloroform. Vertical incision 9 cm. long in the outer margin of the right rectus muscle. Upon opening the peritoneum, the cecum was found to be collapsed. The ileum was very much injected and distended. A large ulcer was found in the ileum near the cecal junction and an intussusception at this point. The cecum was the intussuscipiens, and 25 cm. of the ileum the intussusceptum. The ileum was withdrawn without difficulty. The patient reacted well from the operation. From the forty-first to the forty-sixth day her temperature ranged from 101.4° to 103.4° F. On the forty-sixth day she was transferred to the medical department with a relapse. The temperature was 103° F. She was weak and restless, pulse rapid and feeble, the respirations frequent.

On the fiftieth day the stitches were removed. Wound in fine condition. Hemorrhage from left nostril. Bowels quite free. Pulse rate 152. On the fifty-ninth day the gall-bladder became painful, tender, and palpable. Some cough. On the sixty-sixth day she developed a neuritis in the right leg with subsequent foot-drop. On the seventy-third day the temperature reached normal and remained normal until the patient's discharge from the hospital on the one hundred and second day. She still suffered with partial foot-drop, but otherwise was in good condition.

For 2 cases illustrating traumatic intussusception and that due to malignant growths we are indebted to Dr. Francis T. Stewart, surgeon to the Germantown Hospital. The notes as given by Dr. Stewart are as follows:

Traumatic Intussusception. N. G., aged thirty-six years, was struck just above the crest of the left ilium by a heavy steel beam. Shortly afterward he was admitted to the Germantown Hospital in the most profound shock. At the end of twenty hours his temperature had risen to normal and the pulse had fallen to 110. He had vomited twice and had passed twelve ounces of bloody urine. There was great pain all over the abdomen, a large hematoma in the left loin, and intense rigidity of the abdominal muscles. Liver dulness was decreased by three fingers' breadth, and no dulness could be detected in the flanks. The abdomen was opened in the middle line below the umbilicus and a large extraperitoneal extravasation of blood found extending from the bladder, whose walls were infiltrated with blood, to the left kidney which was normal to palpation. The abdominal muscles on the left side were torn from the left iliac crest. The peritoneal cavity was opened and found to be clean; there was no visceral rupture. In numerous places the small intestine was tightly contracted, the areas involved varying greatly in extent, so that in certain regions the intestine seemed to be ligatured, while in others it resembled a piece of tape. In one place the contracted intestine had passed into the relaxed segment below for a distance of two inches. The intussusception was reduced, the peritoneal cavity closed, and the extraperitoneal tissue drained. The patient died four hours later of shock.

Intussusception due to Malignant Growth. C. H., aged forty years, had sarcoma of the iris removed about nine months ago and later the eyeball for recurrence. Now has general melanotic sarcomatosis. He was admitted on April 7, 1906, with severe abdominal pain and non-fecal vomiting for twenty-four hours, elongated mass in right side of abdomen becoming harder with colic, no blood or mucus from rectum, no distention; bowel movements have been growing smaller for the past two or three days. Incision on right side, intussusception about one foot long of ileum into ileum, apex of the intussusception entering colon and reaching hepatic flexure, the apex of the intussusception being formed by a tumor about one-half inch in diameter in the bowel wall. This, as well as several other tumors, showed marked umbilication. Intussusception reduced with difficulty. Recovery from operation uneventful.

The diagnosis of acute intussusception in children is less difficult than in the adult. In children it is the most common cause of intestinal obstruction, and children are very much less liable to inflammatory affection of the peritoneum and abdominal organs, thus offering less obscurity to the trouble. It must be remembered that all acute intussusceptions do not progress to obstructive conditions. It is probable that a very large percentage of attacks of acute severe abdominal pains are due to temporary, short invaginations which quickly relieve themselves by unfolding, the incarceration being short-lived.

The onset of the attack is usually sudden. Treves thinks that 75 per cent. of acute cases have a sudden onset. There is usually evidence of some one of the predisposing causes preceding the seizure.

This is more commonly noted in adults, as we have the benefit of the individual's ability to state the circumstances relating to the attack. The mode of onset is influenced by the portion of the bowel involved. In the ileocolic the commencement is always sudden, while that of the large bowel is most often gradual. In patients who give no apparent cause for an attack, stating that they were in perfect health up to the time of onset, it is well to investigate carefully the food ingested during the preceding twenty-four or forty-eight hours, for we believe that a satisfactory explanation, namely, ptomaïne poisoning, will be found to account for the 52 per cent. in which no evident exciting cause has been offered.[10]

The most persistent and also the first symptom is pain. It may reach its maximum intensity when the invagination occurs and then moderate, although it is usually more gradual, becoming more and more severe until the parts become fixed or gangrenous, when the pain diminishes or ceases altogether. This tendency to diminish in intensity is significant and should always lead to a suspicion of the trouble. The character of the pain is colicky and intermittent at first, becoming more constant as the obstruction progresses. This is in accordance with the rule that intermittent pain almost invariably indicates partial obstruction, while in complete obstruction the pain is constant and more severe and without marked exacerbations. In the incomplete obstruction the pain may not completely disappear, but there are distinct exacerbations. The pains are at first general and ill defined, becoming localized later. Invaginations of the small bowel give rise to more intense pain than those of the large bowel, due to the greater muscular development of the former. The location of the pain is indefinite until the invagination becomes fixed, when it localizes to the area of bowel involved.

Vomiting is most common in the acute intussusception. It is not so severe as in other forms of intestinal obstruction, and does not appear as early, nor is there the same tendency to stercoraceous vomiting. It is likely to occur in intervals and gives great temporary relief. This temporary relief is a characteristic feature of intussusception. As a rule the higher the invagination the more severe the vomiting.

Rigidity of the abdominal muscles is not met with in intussusception in the early stage, coming on only after peritonitis has set in. Distention is also absent in the majority of cases, only making its appearance late in the attack when the obstruction is complete, or marked peritonitis supervenes. In cases in which marked diarrhœa is an early symptom the belly is apt to be scaphoid. Tenderness is a late symptom and indicates peritonitis. In the early stages pressure offers distinct relief.

The presence of a tumor, which in children and in chronic intussusception is of great diagnostic value, is not met with so often in acute cases in the adult. Leichenstein found a tumor present in about 50 per cent. of all cases in all ages. It is most frequently met with in the cecal and ileocolic varieties. In none of our cases was a tumor demonstrable. When present it may be discovered through the abdominal walls or in the rectum. It varies in size with the size of the intussusception, but never gives an idea of the actual amount of bowel invaginated. It is usually hard and resisting. It is also usually more prominent during attacks of pain and sometimes has a distinct range of motion.

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[10] Treves' table of Intestinal Obstruction, p. 178.

The temperature, as a rule, remains normal or slightly above normal, except in cases associated with shock. Collapse, however, is far less common than in obstruction due to bands. It is far more common in young infants and is then rarely fatal. Tenesmus in acute and subacute attacks is a severe, early, and constant symptom. The nearer the invagination is to the anus the severer the tenesmus. It may or may not be associated with blood or blood-stained mucus. Thirst in intestinal obstruction depends upon the degree of vomiting, hence is less marked in intussusception than other forms of strangulation.

We believe that operation is the safest and most logical procedure in the treatment of acute intussusception. To have the best results early diagnosis and prompt action are essential. Any attempt to reduce a well-defined intussusception by the use of forced enemas is in our opinion losing valuable time.

PRIMARY CARCINOMA OF THE URINARY BLADDER.

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A review of the literature has failed to reveal a recent report of any considerable series of cases of primary carcinoma of the bladder thoroughly studied from both the clinical and the anatomical sides. Going back a few years there is no lack of material from which to draw, and it is from this source that most of our literature is derived. The marked discrepancies in the statistics and in the statements of the various authors would lead one to infer that most of the original literature will not bear a very close inspection, and this is to a certain extent borne out by the facts. Carcinoma of the bladder is a hidden disease. One cannot note its beginning and watch its progress from day to day. Furthermore, its location and malignant nature make its clinical manifestations peculiarly subject to confusion with those of complicating or neighboring diseases. Such being the case, it is